of the most commonly implemented data formats used by the coastal science community. New and enhanced functionalities that upgrade COAST to COAST 2.0 include the development of the Temporal Visualization Tool (TVT) plug-in, the Recursive Online Remote Data-Data Mapper (RECORD-DM) utility, the Import Data Tool (IDT), and the Add Points Tool (APT). With these improvements, users can integrate their own data with other data sources, and visualize the resulting layers of different data types (such as spatial and spectral, for simultaneous visual analysis), and visualize temporal changes in areas of interest.

This work was done by Richard Brown of Science Systems and Applications, Inc., Andrew Navard of Computer Sciences Corporation, and Beth Nguyen of Delta Computer Solutions for Stennis Space Center. For more information, contact the Office of Chief Technologist at Stennis Space Center, 228-688-1929. Refer to SSC-00357.

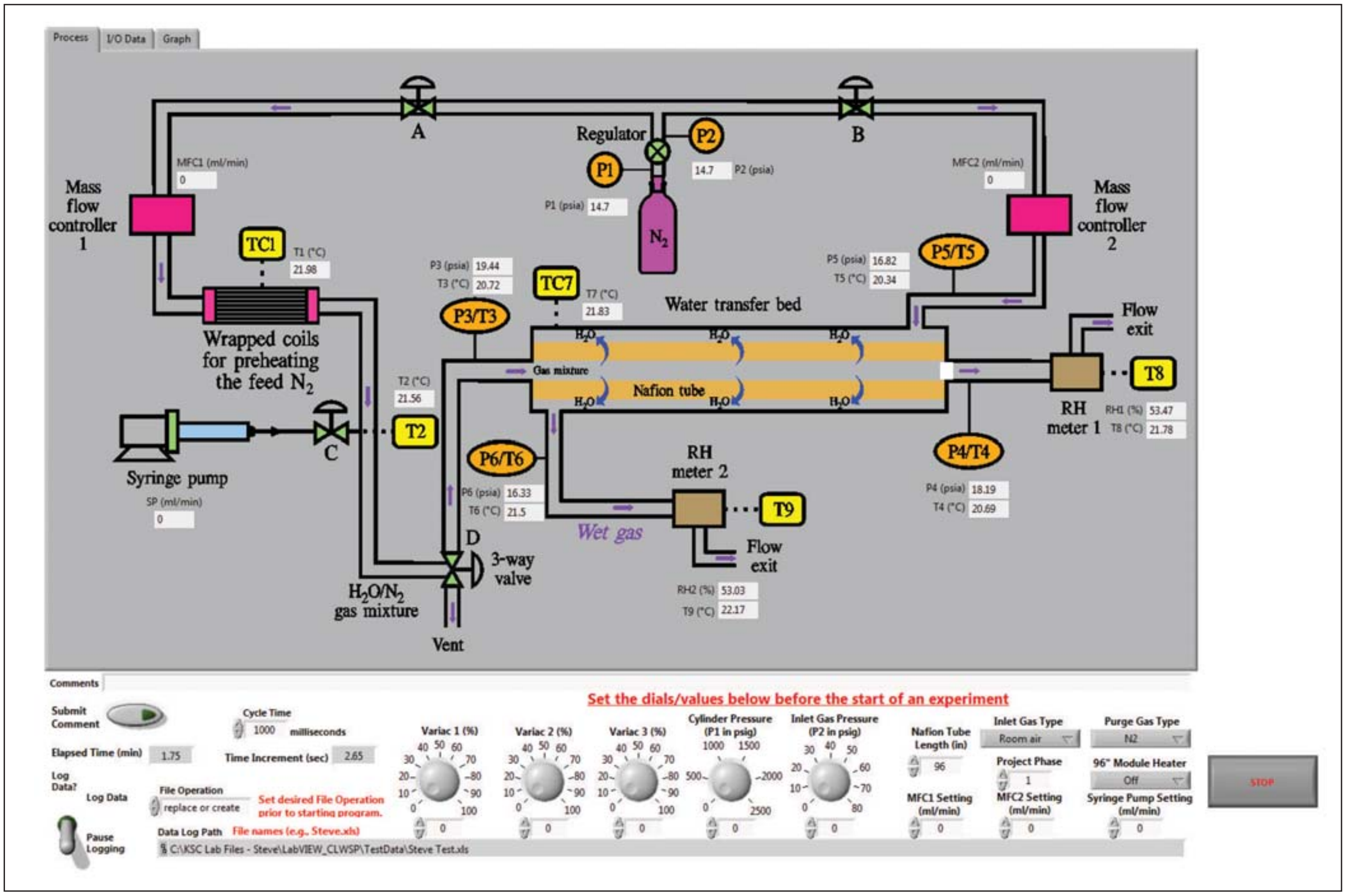
Generalized Software Architecture Applied to the Continuous Lunar Water Separation Process and the Lunar Greenhouse Amplifier

John F. Kennedy Space Center, Florida

This innovation provides the user with autonomous on-screen monitoring, embedded computations, and tabulated output for two new processes. The software was originally written for the Continuous Lunar Water Separation Process (CLWSP), but was found to be general enough to be applicable to the Lunar Greenhouse Amplifier (LGA) as well, with minor alterations. The resultant program should have general applicability to many laboratory processes (see figure).

The objective for these programs was to create a software application that would provide both autonomous monitoring and data storage, along with manual manipulation. The software also allows operators the ability to input experimental changes and comments in real time without modifying the code itself. Common process elements, such as thermocouples, pressure transducers, and relative humidity sensors, are easily incorporated into the program in various configurations, along with specialized devices such as photodiode sensors.

The goal of the CLWSP research project is to design, build, and test a new method to continuously separate, capture, and quantify water from a gas stream. The application is any In-Situ Resource Utilization (ISRU) process that desires to extract or produce water from lunar or planetary regolith. The present work is aimed at circumventing



Sample Process

current problems and ultimately producing a system capable of continuous operation at moderate temperatures that can be scaled over a large capacity range depending on the ISRU process.

The goal of the LGA research project is to design, build, and test a new type of greenhouse that could be used on the moon or Mars. The LGA uses super greenhouse gases (SGGs) to absorb long-wavelength radiation, thus creating a highly efficient greenhouse at a future lunar or Mars outpost. Silica-based glass, although highly efficient at trapping heat, is heavy, fragile, and not suitable for space greenhouse applications. Plastics are much lighter and resilient, but are not efficient for absorbing long-wavelength infrared radiation and therefore will lose more heat to the environment compared to glass. The LGA unit uses a transparent polymer "antechamber" that surrounds part of the greenhouse and encases the SGGs, thereby minimizing infrared losses through the plastic windows. With ambient temperatures at the lunar poles at –50 °C, the LGA should provide a substantial enhancement to currently conceived lunar greenhouses. Positive results obtained from this project could lead to a future large-scale system capable of running autonomously on the Moon, Mars, and beyond.

The software for both applications needs to run the entire units and all subprocesses; however, throughout testing, many variables and parameters need to be changed as more is learned about the system operation. The software provides the versatility to permit the software operation to change as the user requirements evolve.

This work was done by Stephen Perusich, Thomas Moss, and Anthony Muscatello of Kennedy Space Center. Further information is contained in a TSP (see page 1). KSC-13539

Graphical Language for Data Processing

Stennis Space Center, Mississippi

A graphical language for processing data allows processing elements to be connected with virtual "wires" that represent data flows between processing modules. The processing of complex data, such as lidar data, requires many different algorithms to be applied. The purpose of this innovation is to automate the processing of complex data, such as LIDAR, without the need for complex scripting and programming languages.

The system consists of a set of user-interface components that allow the user to drag and drop various algorithmic and processing components onto a process graph. By working graphically, the user can completely visualize the process flow and create complex diagrams. This innovation supports the nesting of graphs, such that a graph can be included in another graph as a single step for processing.

In addition to the user interface components, the system includes a set of .NET classes that represent the graph internally. These classes provide the internal system representation of the graphical user interface. The system includes a graph execution component that reads the internal representation of the graph (as described above) and executes that graph. The execution of the graph follows the interpreted model of execution in that each node is traversed and executed from the original internal representation. In addition, there are components that allow external code elements, such as algorithms, to be easily integrated into the system, thus making the system infinitely expandable.

This work was done by Keith Alphonso of Diamond Data Systems for Stennis Space Center. For more information, contact Keith Alphonso, Director Diamond Data Systems, a Geocent Company at kalphonso@Geocent.com, (228) 688-3145. SSC-00324

Monitoring Areal Snow Cover Using NASA Satellite Imagery

Goddard Space Flight Center, Greenbelt, Maryland

The objective of this project is to develop products and tools to assist in the hydrologic modeling process, including tools to help prepare inputs for hydrologic models and improved methods for the visualization of streamflow forecasts. In addition, this project will facilitate the use of NASA satellite imagery (primarily snow cover imagery) by other federal and state agencies with operational streamflow forecasting responsibilities.

A GIS software toolkit for monitoring areal snow cover extent and producing streamflow forecasts is being developed. This toolkit will be packaged as multiple extensions for ArcGIS 9.x and an open-source GIS software package. The toolkit will provide users with a means for ingesting NASA EOS satellite imagery (snow cover analysis), preparing hydrologic model inputs, and visualizing streamflow forecasts. Primary products include a software tool for predicting the presence of snow under clouds in satellite images; a software tool for producing gridded temperature and precipitation forecasts; and a suite of tools for visualizing hydrologic model forecasting results. The toolkit will be an expert system designed for operational users that need to generate accurate streamflow forecasts in a timely manner.

The Remote Sensing of Snow Cover Toolbar will ingest snow cover imagery from multiple sources, including the MODIS Operational Snowcover Data and convert them to gridded datasets that can be readily used. Statistical techniques will then be applied to the gridded snow cover data to predict the presence of snow under cloud cover. The toolbar has the ability to ingest both binary and fractional snow cover data. Binary mapping techniques use a set of thresholds to determine whether a pixel contains snow or no snow. Fractional mapping techniques provide information regarding the percentage of each pixel that is covered with snow. After the imagery has been ingested, physiographic data is attached to each cell in the snow cover image. This data can be obtained from a digital elevation model (DEM) for the area of interest. If